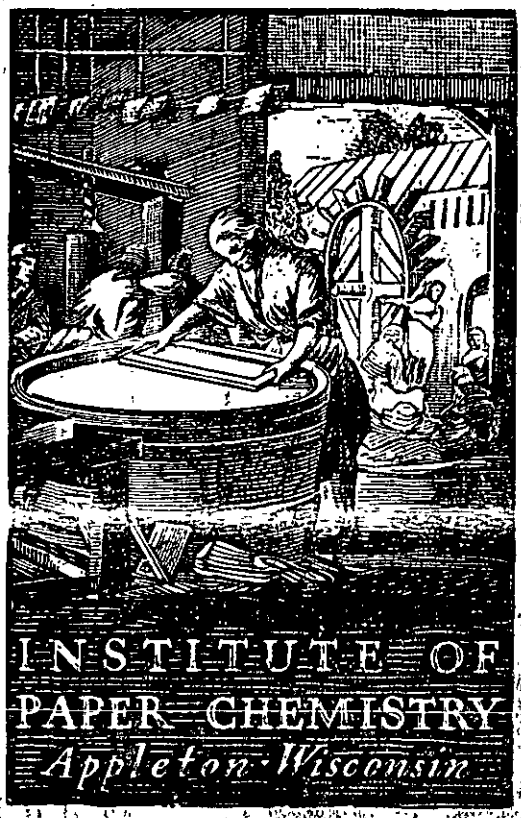

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

Project 1108-17

Progress Report 59

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

February 1, 1960

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

Project 1108-17

Progress Report 59

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

February 1, 1960

TABLE OF CONTENTS

TABLE OF CONTENTS--CONTINUED

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SUMMARY

The purpose of this study is to provide a continuous evaluation of the quality and runability of the corrugating mediums manufactured by members of the Fourdrinier Kraft Board Institute. Two rolls of corrugating medium are submitted on a weekly basis from the production of each machine. Each roll is evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), and runability, the latter being measured by corrugating each roll under standardized conditions into A-flute board at 600 feet per minute with minimum tension. If runability is unsatisfactory at this speed, the speed of the corrugator is reduced by increments of 25 f.p.m. until satisfactory runability is obtained as indicated by the presence of no ruptured flutes. If the runability is satisfactory at 600 f.p.m. with minimum tension, the tension is increased by increments of 1/2 lb. per in. to determine the maximum tension at which satisfactory runability is obtained. The maximum tension used is 1-1/2 lb. per in. Flat crush tests are made on the single-faced board obtained at the maximum speed with minimum tension.

In addition to the evaluation carried out at the Institute as described above, each participant may, if he so desires, evaluate each roll of corrugating medium for Concora flat crush (conditioned after fluting) and submit the results to The Institute of Paper Chemistry, thus providing an opportunity to include a comparison of Institute and mill Concora flat crush results in the monthly progress reports.

The study, as described in the preceding paragraphs, provides several important benefits. For example, it enables each participant to evaluate his quality position in relation to the rest of the industry on a continuing basis. In addition, it provides a basis for comparing Concora flat crush results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This type of comparison is a helpful adjunct to conventional calibration procedures. Another benefit is provided by virtue of the fact that the study is accumulating an ever-growing reserve of background information essential for the judicious interpretation of any proposed specifications on corrugating medium whether on a company or industry basis.

During the month of January, 105 rolls of corrugating medium were submitted to The Institute of Paper Chemistry from the production of twenty machines.

Shown below are the maximum and minimum current machine averages for each test (the current machine average is the average of the results obtained for all rolls submitted from a given machine); also given for each test is the current F.K.I. average which is determined by averaging the current machine averages and is indicative of the test level being maintained by the industry as a whole to the extent that the industry is represented by the participating machines:

	Maximum Current Machine Average	Minimum Current Machine Average	Current F.K.I. Average
Basis weight, lb.	30.0	26.3	27.6
Caliper, pt.	11.5	9.2	10.4
Concora flat crush, p.s.i. (Conditioned after fluting)	39.7	31.4	35.6
Single-face flat crush, p.s.i.	36.4	28.7	31.9

The runability data for the 105 rolls of medium evaluated during January are summarized as follows:

Runability	Number of Rolls	Percentage of Total Rolls
Less than 600 f.p.m. with minimum tension	None	0
600 f.p.m. with minimum tension	None	0
600 f.p.m. with tension of $\frac{1}{2}$ lb. per in.	1	1.0
600 f.p.m. with tension of 1 lb. per in.	15	14.3
600 f.p.m. with tension of 1-1/2 lb. per in.	89	84.8

Concora flat crush results were submitted for fourteen of the twenty machines from which rolls were received during the current month. The comparisons of Concora flat crush test results based on the average result obtained at the Institute and at the mill for all rolls compared for each machine are summarized below. Shown in this summary is the number of machines (and the percentage of the total machines which they represent) whose Concora test averages fall within the indicated percentage ranges from the results obtained at the Institute on the same rolls.

Average Percentage Difference Between Institute and Mill Concora Flat Crush Test Results [a]	Number of Machines	Percentage of All Machines
± 1.0	0	0.0
± 2.5	3	21.4
± 5.0	7	50.0
± 7.5	12.	85.7
± 10.0	13	92.9
± 12.3	14	100.0

[a] The average obtained at the Institute was used as the point of reference in the calculation of the percentage differences.

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

PURPOSE OF THIS STUDY

The purpose of this study is to provide a continuous evaluation of the quality and runability of corrugating medium produced by members of the Fourdrinier Kraft Board Institute. The study, as it progresses, is accumulating a backlog of data and experience which provides several important benefits. For example, it enables each participant to evaluate his position in relation to the rest of the industry. In addition, it provides background information essential for the judicious interpretation of any proposed specifications on corrugating medium (on either a company or industry basis). The program also provides a basis for comparing Concora results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This comparison is a helpful adjunct to conventional calibration procedures.

PROCEDURE FOR PARTICIPATING

The procedure for participating in this study involves the submission of two rolls of corrugating medium per week from each machine to The Institute of Paper Chemistry. These rolls are taken from regular production runs on <u>different</u> days. Each roll is 10 to 12 inches wide and contains approximately 5,000 lineal feet of medium (approximately 30 inches in diameter). When received by the Institute, each roll is assigned a code letter and number. The rolls are numbered in the sequence in which they are received. Code letters are assigned on the basis of machines, and a given machine is assigned a

different code letter each month in order to mask the identity of the mills. For purposes of reference, an outline of this program which describes the necessary instructions for sampling was appended to Progress Report One in this series.

PRESENTATION AND DISCUSSION OF TEST RESULTS OBTAINED AT THE INSTITUTE OF PAPER CHEMISTRY

During the month of January, one hundred and five rolls of corrugating medium were selected from the production of twenty machines and submitted to The Institute of Paper Chemistry for evaluation. A tabulation of the number of rolls submitted from each machine is given in Table I.

Each sample of corrugating medium was evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), H. and D. flat crush (single-faced board), and runability. (Concora flat crush results obtained on specimens tested immediately after fluting were included in Progress Reports 45 through 57.) Runability was measured by corrugating each roll under standardized conditions on the Institute's corrugator into A-flute board at 600 feet per minute with minimum tension. If unsatisfactory runability occurred at this speed, the corrugator was slowed down in increments of 25 f.p.m. until satisfactory runability was obtained (no ruptured flutes). If the medium fabricated satisfactorily at 600 f.p.m. with minimum tension, further runs were made at higher tensions to determine when cracking occurred. The higher tensions used were 0.5 lb. per inch, 1.0 lb. per inch, and 1.5 lb. per inch.

Flat crush was determined on the board obtained at a speed of 600 f.p.m. with minimum tension. In addition to information about quality, these

TABLE I

NUMBER OF ROLLS OF CORRUGATING MEDIUM SUBMITTED

FOR EVALUATION FROM EACH MACHINE

Machine Code	Number of Rolls
A	8
B	5
C	8
D	6
E	10
F	8
G	6
H	1
I	4
J	7
K	8
L	3
M	6
N	5
O	6
P	3
Q	4
R	2
S	2
T	3
Total	105

results will provide data which may be useful in studying the relationship between Concora flat crush and combined board flat crush for each participant's medium.

As requested by members of the F.K.B.I., the Concora medium test results are calculated on the basis of pounds of load per unit area rather than on the basis of the formula suggested by the Concora manufacturer and are reported as Concora flat crush test results. In Progress Reports One and Two, the Concora medium test results were reported on the basis of the formula suggested by the Concora manufacturer.

The average test results obtained on the rolls of corrugating medium submitted by each participant (current machine averages) are shown in Table II and graphically presented in Figures 1 to 4. In addition to a comparison of the test data obtained for the various machines, Table II also presents the current F.K.I. averages, cumulative F.K.I. averages, and the F.K.I. indexes. The current F.K.I. average is the average of test results for all machines participating in the study during the current month. The cumulative F.K.I. average is based on the results for the previous twelve-month period excluding the result for the current period. The F.K.I. index is obtained as follows:

$$\frac{\text{current F.K.I. average}}{\text{cumulative F.K.I. average}} \times 100 = \text{F.K.I. index (\%)}$$

The F.K.I. index provides a ready means of comparing the current quality with previous results. An index greater than 100% indicates that current quality is higher than the average result for the previous twelve periods; an index below 100% indicates that current quality is lower than the average result for the previous twelve periods.

TABLE II

SUMMARY OF CURRENT MACHINE AVERAGES
January, 1960

Code	Basis Weight, lb.	Caliper, points	Concora Flat Crush, p.s.i.	Single-face Flat Crush, p.s.i.
A	27.0	10.9	39.7	36.4
B	26.7	10.0	34.3	32.1
C	27.1	10.6	33.4	29.9
D	29.6	10.9	39.0	32.6
E	27.2	11.0	36.9	32.6
F	26.6	11.0	34.5	30.9
G	27.2	9.4	33.1	30.4
H	27.6	10.2	38.0	35.6
I	26.4	10.8	33.9	30.7
J	29.5	9.9	36.1	32.5
K	27.2	9.2	35.1	29.4
L	26.9	10.4	35.9	31.4
M	27.8	10.6	36.6	32.5
N	26.8	10.5	35.5	31.3
O	28.4	11.5	37.4	34.1
P	27.0	9.3	37.6	34.2
Q	27.3	10.7	36.7	32.3
R	29.2	10.8	33.4	30.3
S	30.0	9.2	31.4	28.7
T	26.3	10.0	33.9	30.9
Current F.K.I. Average	27.6	10.4	35.6	31.9
Cumulative F.K.I. Average	27.2	10.2	36.7	33.0
F.K.I. Index, %	101.5	101.8	97.2	96.7

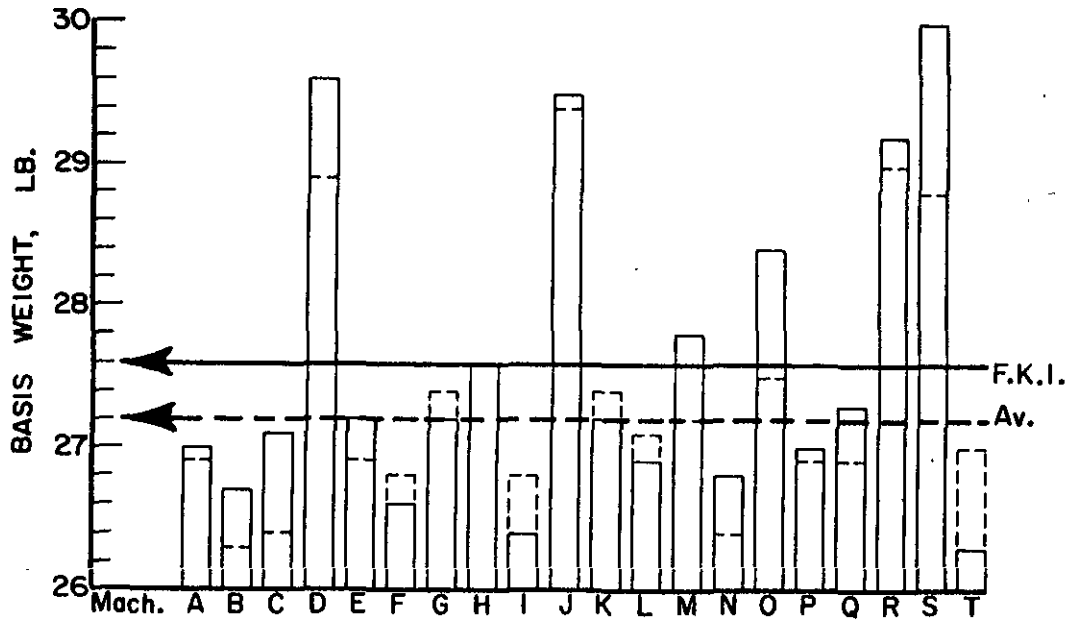

Figure 1

Comparison of Basis Weight Results for January, 1960

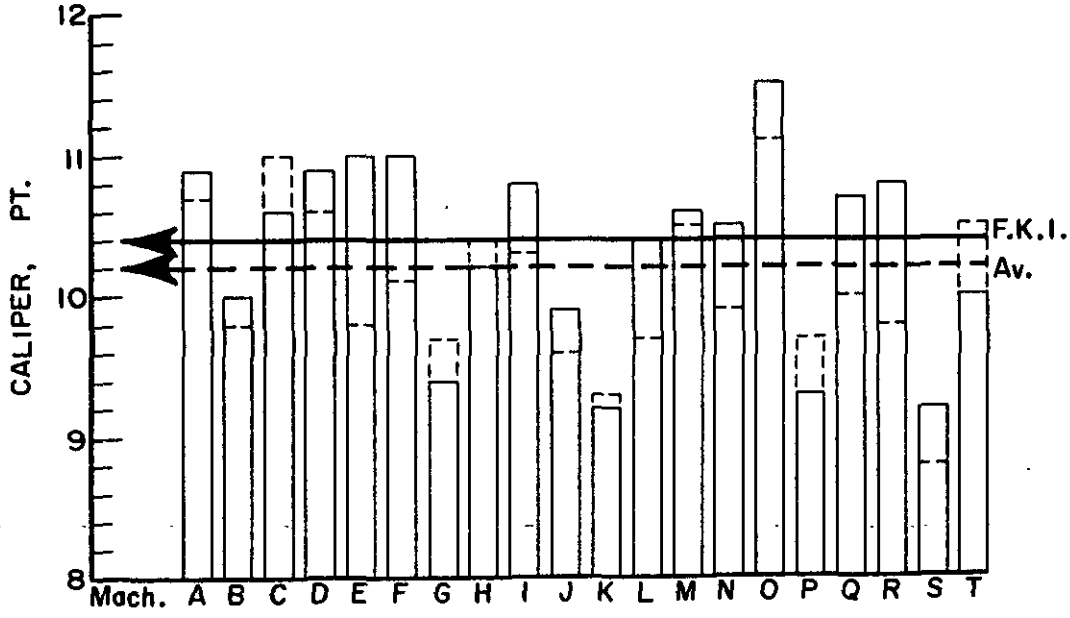

Figure 2

Comparison of Caliper Results for January, 1960

——— Current machine average

- - - - - Cumulative machine average

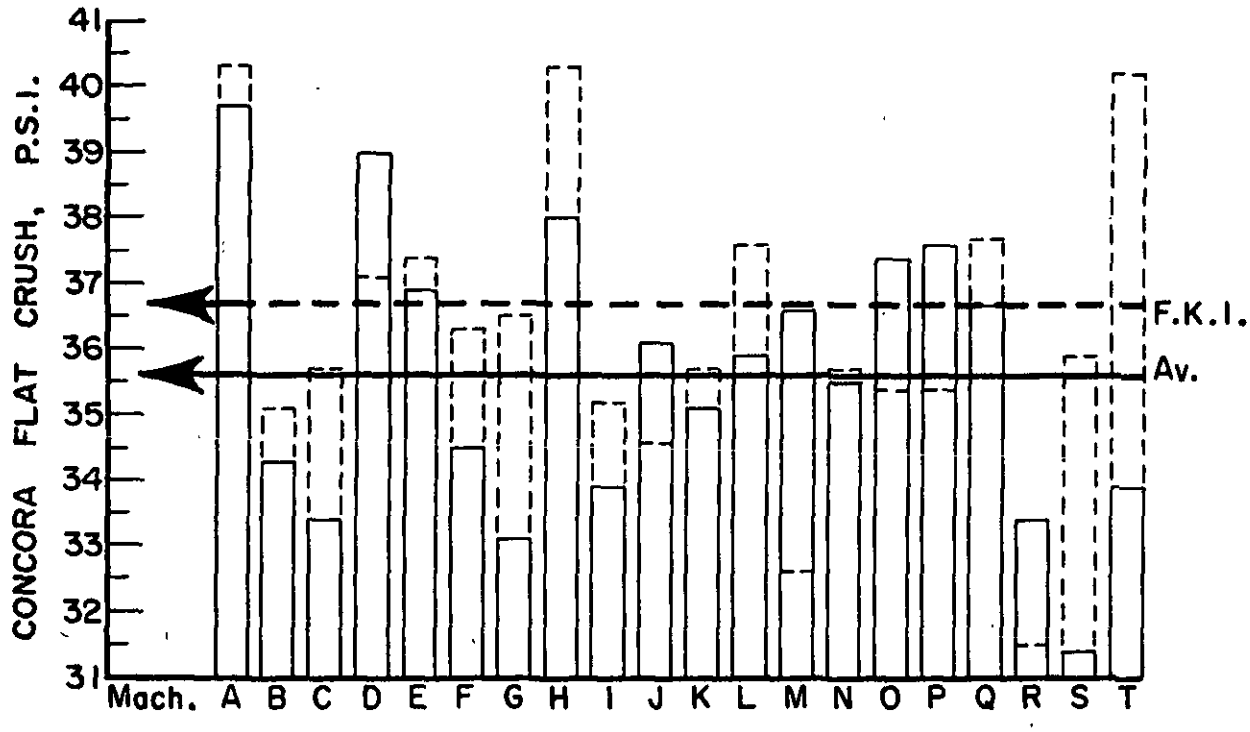

Figure 3

Comparison of Concora Flat Crush Results

for January, 1960

——— Current machine average

– – – – Cumulative machine average

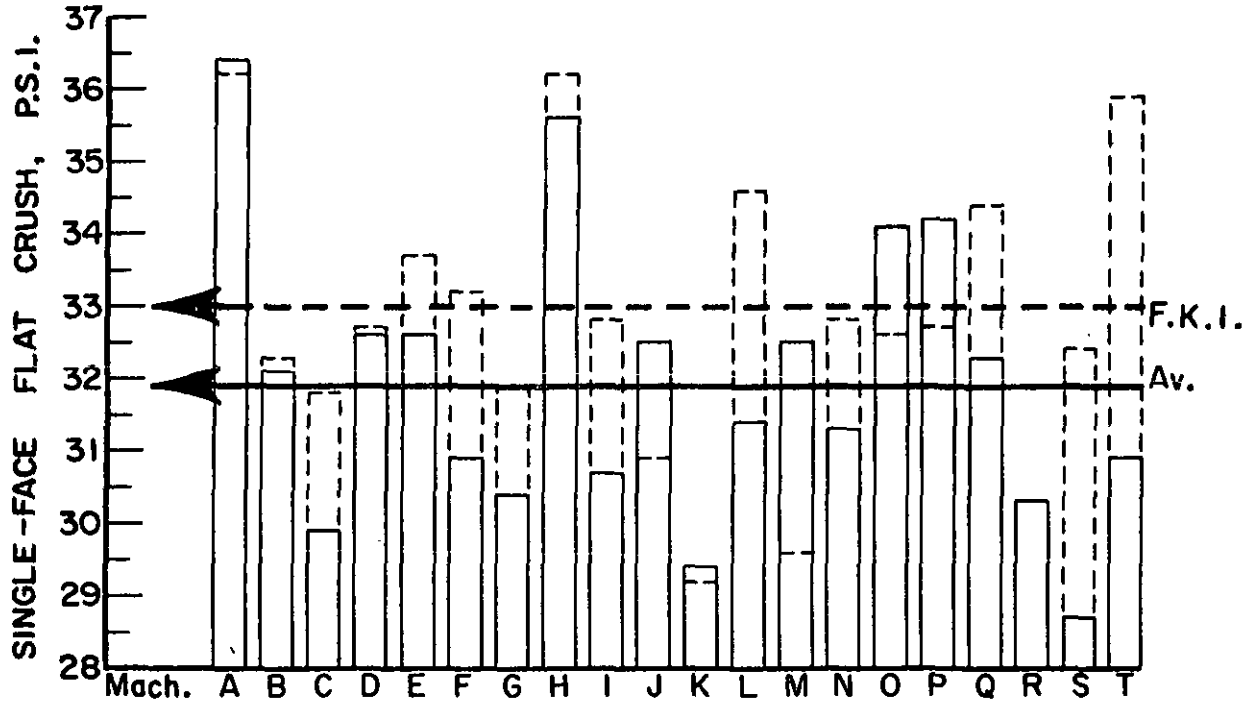

Figure 4

Comparison of Single-Face Flat Crush Results for January, 1960

——— Current machine average

– – – – – Cumulative machine average

In Table II the current machine averages for the month of January are summarized. It may be noted in Table II and Figure 1 that basis weight varied from a low of 26.3 lb. for Machine T to a high of 30.0 lb. for Machine S. The current F.K.I. average for basis weight was 27.6 lb., which was slightly higher than the cumulative F.K.I. average of 27.2 lb. Of the current machine averages shown in Table II, none was below the 26-lb. minimum requirement of Rule 41. On the basis of individual rolls, it may be noted that the tabulated data for each machine shown in Tables III through XXII included five basis weight averages which were below 26 lb.

With regard to the caliper results for the current period, it may be seen in Table II and also in Figure 2 that the lowest average caliper data of 9.2 points was associated with Machines K and S and the highest average of 11.5 points was associated with Machine O. The current F.K.I. average of 10.4 points was slightly higher than the cumulative F.K.I. average of 10.2 points. The minimum caliper requirement of nine points specified in Rule 41 was met by all participants on the basis of the current machine averages shown in Table II. On the basis of individual rolls, three caliper averages were below 9 points.

The Concora flat crush averages obtained on specimens conditioned after fluting are presented graphically in Figure 3 based on the data in Table II. An inspection of these results reveals that 39.7 p.s.i. was the highest average and 31.4 p.s.i. the lowest. Machine A had the highest average and Machine S the lowest. The current F.K.I. average of 35.6 p.s.i. was lower than the cumulative F.K.I. average of 36.7 p.s.i.

The highest single-face flat crush average of 36.4 p.s.i. was obtained for Machine A and the lowest of 28.7 p.s.i. for Machine S. These data are shown in Table II and are presented graphically in Figure 4. The current F.K.I. average was 31.9 p.s.i., whereas the cumulative F.K.I. average was 33.0 p.s.i.

The runability data for the 105 rolls of medium evaluated during January are summarized as follows:

Runability	Number of Rolls	Percentage of Total Rolls
Less than 600 f.p.m. with minimum tension	None	0
600 f.p.m. with minimum tension	None	0
600 f.p.m. with tension of 1/2 lb. per in.	1	1.0
600 f.p.m. with tension of 1 lb. per in.	15	14.3
600 f.p.m. with tension of 1-1/2 lb. per in.	89	84.8

For the current period, the current F.K.I. averages for basis weight and caliper were higher than their respective cumulative F.K.I. averages, and the current F.K.I. averages for Concora flat crush and single-face flat crush were lower than their respective cumulative F.K.I. averages.

The test results obtained on the sample lots submitted from the production of each of the machines are shown in Tables III through XXII for Machines A through T, respectively. The maximum, minimum, and average test results obtained on each sample lot are shown for all tests except basis weight for which only the average is shown; in addition, the over-all average result for all sample lots submitted from a given machine is shown

for each test. The latter over-all averages are reported as "current machine averages." A cumulative machine average is also shown and is calculated by averaging the current machine averages for the previous twelve periods (excluding the current period). Also shown for each machine in Tables III to XXII are the machine factor and machine index which are defined as follows:

$$\frac{\text{current machine average}}{\text{cumulative machine average}} \times 100 = \text{machine factor (\%)}$$

$$\frac{\text{current machine average}}{\text{cumulative F.K.I. average}} \times 100 = \text{machine index (\%)}$$

The machine factor and machine index provide a means for comparing the current machine average with either the previous results for that particular machine or with the cumulative results for all machines--i.e., the cumulative F.K.I. average.

TABLE III

SUMMARY OF TEST RESULTS FOR MACHINE A
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
A-1	12-22-59	12-28-59	529	26.5	11.2	10.1	10.5	41.4	35.4	38.3	35.4	33.4	34.4	1-1/2
A-2	12-29-59	1- 4-60	530	26.9	11.9	10.9	11.1	40.2	36.0	38.4	38.6	36.0	37.2	1-1/2
A-3	1- 1-60	1- 5-60	531	27.4	12.9	11.4	12.0	44.4	39.6	41.4	37.8	35.6	36.6	1-1/2
A-4	1- 8-60	1-13-60	532	27.0	11.1	10.2	10.4	45.6	37.2	41.8	38.0	36.0	36.9	1
A-5	1- 8-60	1-13-60	533	27.2	10.9	10.2	10.6	43.2	38.4	39.8	37.2	35.6	36.6	1
A-6	1-12-60	1-18-60	534	27.6	12.8	11.0	11.4	45.6	36.6	40.8	37.4	35.6	36.2	1-1/2
A-7	1-15-60	1-20-60	535	26.6	11.2	10.7	10.9	43.8	33.6	39.8	39.2	37.8	38.1	1-1/2
A-8	1-20-60	1-25-60	536	27.1	10.9	10.2	10.6	39.0	36.6	37.6	36.8	33.4	34.8	1-1/2
Current Machine Average				27.0			10.9			39.7			36.4	
Cumulative Machine Average				26.9			10.7			40.3			36.2	
Machine Factor, %				100.7			102.4			98.7			100.3	
Machine Index, %				99.5			107.7			108.4			110.2	

TABLE IV

SUMMARY OF TEST RESULTS FOR MACHINE B
January, 1960

B-1	12-28-59	1-15-60	--	26.6	10.1	9.7	9.9	36.0	31.2	33.4	33.6	32.6	33.0	1-1/2
B-2	1- 4-60	1-15-60	--	26.8	10.3	9.8	10.1	38.4	34.2	35.9	32.8	31.8	32.4	1-1/2
B-3	1- 7-60	1-15-60	--	26.3	9.6	9.1	9.3	34.2	30.6	31.7	31.4	30.0	30.8	1-1/2
B-4	1-11-60	1-19-60	--	26.6	10.3	10.0	10.2	37.8	32.4	35.2	31.6	30.2	31.0	1-1/2
B-5	1-14-60	1-19-60	--	27.4	10.7	10.4	10.5	36.6	30.6	35.3	34.6	32.6	33.4	1-1/2
Current Machine Average				26.7			10.0			34.3			32.1	
Cumulative Machine Average				26.3			9.8			35.1			32.3	
Machine Factor, %				101.8			101.8			97.7			99.7	
Machine Index, %				98.4			98.4			93.5			97.4	

TABLE V

SUMMARY OF TEST RESULTS FOR MACHINE C
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
C-1	12- 8-59	1- 4-60	17	27.2	11.7	10.8	11.1	35.4	29.4	33.0	30.6	30.0	30.3	1
C-2	12-11-59	1- 4-60	18	28.7	11.5	10.9	11.1	34.8	30.0	33.4	33.6	30.2	31.2	1
C-3	12-18-59	1- 4-60	19	28.2	11.2	10.2	10.7	36.6	32.4	34.8	31.4	28.4	29.6	1
C-4	12-21-59	1- 4-60	20	26.1	10.9	10.4	10.8	36.0	33.0	34.7	29.6	27.2	28.3	1-1/2
C-5	12-30-59	1-12-60	21	26.3	10.1	9.4	9.8	38.4	31.2	34.8	32.4	31.0	31.8	1-1/2
C-6	1- 1-60	1-12-60	22	27.9	11.0	10.1	10.6	35.4	31.8	34.0	32.0	30.4	31.3	1-1/2
C-7	1- 7-60	1-22-60	23	27.4	11.6	10.7	11.1	31.8	28.8	30.6	29.4	27.0	28.0	1-1/2
C-8	1-11-60	1-18-60	24	25.2	9.9	9.0	9.4	33.6	28.8	32.2	29.4	27.6	28.7	1-1/2
Current Machine Average				27.1			10.6			33.4			29.9	
Cumulative Machine Average				26.4			11.0			35.7			31.8	
Machine Factor, %				102.7			95.9			93.5			94.1	
Machine Index, %				99.8			103.9			91.2			90.6	

TABLE VI

SUMMARY OF TEST RESULTS FOR MACHINE D
January, 1960

D-1	12-19-59	1- 8-60	297	29.5	11.6	10.6	11.1	40.2	36.0	38.8	34.6	32.4	33.4	1-1/2
D-2	12-29-59	1- 8-60	298	30.4	11.8	10.8	11.2	40.8	38.4	40.0	34.8	32.0	33.2	1-1/2
D-3	12-31-59	1- 8-60	299	30.0	11.7	10.7	11.2	39.6	37.8	38.4	33.8	32.4	33.1	1-1/2
D-4	1- 6-60	1-21-60	300	27.8	11.0	9.6	10.3	42.6	36.0	38.4	32.8	30.6	31.8	1
D-5	1- 7-60	1-21-60	301	30.0	11.1	10.3	10.7	43.2	39.0	40.7	34.4	31.2	32.8	1-1/2
D-6	1-14-60	1-21-60	302	29.8	11.2	10.3	10.8	39.6	36.0	37.9	32.4	29.0	31.2	1-1/2
Current Machine Average				29.6			10.9			39.0			32.6	
Cumulative Machine Average				28.9			10.6			37.1			32.7	
Machine Factor, %				102.5			102.7			105.1			99.8	
Machine Index, %				109.0			107.0			106.4			98.7	

TABLE VII

SUMMARY OF TEST RESULTS FOR MACHINE E
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
E-1	11-20-59	12-28-59	332	27.7	11.8	10.2	11.0	43.8	37.8	40.4	37.8	32.2	35.5	1
E-2	12-11-59	12-28-59	333	25.7	11.3	10.1	10.8	37.2	33.0	34.9	31.6	28.8	29.8	1-1/2
E-3	12-14-59	12-28-59	334	26.3	12.0	10.8	11.1	38.4	31.8	34.4	30.2	29.0	29.5	1-1/2
E-4	12-14-59	12-28-59	335	27.6	12.0	10.0	11.0	39.6	32.4	35.6	34.8	31.4	33.2	1-1/2
E-5	12-16-59	12-29-59	336	27.0	12.0	10.5	11.4	40.2	34.2	37.0	33.4	31.6	32.8	1-1/2
E-6	12-19-59	12-29-59	337	27.4	11.2	10.5	10.9	40.2	32.4	36.6	35.6	31.4	33.6	1
E-7	12-23-59	1-15-60	338	27.0	11.6	10.7	11.2	37.8	33.6	36.6	33.8	31.8	33.1	1-1/2
E-8	1- 1-60	1-15-60	339	27.5	11.3	10.1	10.7	39.6	35.4	37.6	34.6	31.2	33.1	1-1/2
E-9	1- 7-60	1-18-60	340	28.1	12.6	10.8	11.5	40.8	36.0	38.5	34.6	32.4	33.5	1-1/2
E-10	1- 9-60	1-18-60	341	27.3	11.7	10.3	10.9	39.0	35.4	36.8	32.4	30.6	31.5	1-1/2
Current Machine Average				27.2			11.0			36.9			32.6	
Cumulative Machine Average				26.9			9.8			37.4			33.7	
Machine Factor, %				101.0			112.4			98.5			96.7	
Machine Index, %				100.0			108.6			100.5			98.7	

TABLE VIII

SUMMARY OF TEST RESULTS FOR MACHINE F
January, 1960

F-1	12-14-59	12-28-59	228	26.7	11.9	10.8	11.4	36.0	33.0	34.6	32.0	28.4	30.6	1-1/2
F-2	12-17-59	12-28-59	229	26.9	11.9	11.1	11.6	36.0	31.2	34.1	32.6	30.0	31.6	1-1/2
F-3	12-20-59	12-28-59	230	26.9	12.0	11.2	11.7	34.2	31.8	33.4	32.0	30.2	31.3	1-1/2
F-4	12-21-59	12-28-59	231	26.9	12.0	11.3	11.8	37.8	33.0	34.9	33.4	30.6	31.7	1
F-5	1- 7-60	1-18-60	232	26.4	10.9	10.2	10.5	39.6	34.8	37.4	35.0	31.2	32.4	1-1/2
F-6	1- 8-60	1-18-60	233	26.0	10.9	10.2	10.5	38.4	33.6	36.7	32.2	31.6	31.9	1-1/2
F-7	1-11-60	1-18-60	234	26.2	10.8	10.1	10.5	34.2	28.8	31.4	29.2	26.4	27.7	1-1/2
F-8	1-12-60	1-18-60	235	26.6	10.6	10.0	10.2	34.2	32.4	33.5	31.8	28.8	30.0	1-1/2
Current Machine Average				26.6			11.0			34.5			30.9	
Cumulative Machine Average				26.8			10.1			36.3			33.2	
Machine Factor, %				99.0			109.1			95.0			92.9	
Machine Index, %				97.7			108.5			94.1			93.5	

TABLE IX

SUMMARY OF TEST RESULTS FOR MACHINE G
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb.per 100 sq. ft.	Caliper, points Max.	Caliper, points Min.	Caliper, points Av.	Concora Flat Crush, p.s.i. Max.	Concora Flat Crush, p.s.i. Min.	Concora Flat Crush, p.s.i. Av.	Single-Face Flat Crush, p.s.i. Max.	Single-Face Flat Crush, p.s.i. Min.	Single-Face Flat Crush, p.s.i. Av.	Runability Maximum Tension at 600 f.p.m., lb./in.
G-1	12-28-59	1- 4-60	221	27.4	10.0	9.8	9.9	35.4	31.2	33.2	31.6	30.0	31.0	1-1/2
G-2	12-28-59	1- 4-60	222	26.9	9.6	9.0	9.4	34.2	25.3	30.7	32.0	28.4	29.8	1-1/2
G-3	12-28-59	1- 4-60	229	27.4	10.2	9.8	10.0	35.4	28.8	32.3	30.0	27.4	28.4	1-1/2
G-4	12-28-59	1- 4-60	230	27.0	9.9	9.0	9.5	36.6	27.0	32.3	30.6	28.4	29.6	1-1/2
G-5	1- 6-60	1-11-60	237	27.1	9.2	8.0	8.9	37.2	34.2	35.5	32.0	30.6	31.3	1-1/2
G-6	1- 6-60	1-11-60	238	27.3	9.1	8.4	8.9	37.2	31.8	34.4	33.4	31.2	32.1	1-1/2
Current Machine Average				27.2			9.4			33.1			30.4	
Cumulative Machine Average				27.4			9.7			36.5			31.9	
Machine Factor, %				99.1			96.8			90.7			95.1	
Machine Index, %				100.0			92.5			90.2			92.0	

TABLE X

SUMMARY OF TEST RESULTS FOR MACHINE H
January, 1960

H-1	12-22-59	1-14-60	372	27.6	10.3	10.0	10.2	39.6	36.6	38.0	37.4	34.8	35.6	1
Current Machine Average				27.6			10.2			38.0			35.6	
Cumulative Machine Factor, %				27.6			10.4			40.3			36.2	
Machine Factor, %				100.0			98.6			94.3			98.5	
Machine Index, %				101.6			100.4			103.8			107.8	

TABLE XI

SUMMARY OF TEST RESULTS FOR MACHINE I
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points Max.	Caliper, points Min.	Caliper, points Av.	Concora Flat Crush, p.s.i. Max.	Concora Flat Crush, p.s.i. Min.	Concora Flat Crush, p.s.i. Av.	Single-Face Flat Crush, p.s.i. Max.	Single-Face Flat Crush, p.s.i. Min.	Single-Face Flat Crush, p.s.i. Av.	Runability Maximum Tension at 600 f.p.m., lb./in.
I-1	12-21-59	12-28-59	227	27.4	11.7	10.5	11.1	35.4	31.8	33.4	33.4	30.8	32.6	1-1/2
I-2	12-21-59	12-28-59	228	27.2	11.2	10.9	11.0	36.6	31.8	34.9	32.0	29.2	31.1	1-1/2
I-3	1- 7-60	1-13-60	235	25.7	10.9	10.1	10.5	36.6	29.4	32.5	31.2	27.8	29.4	1-1/2
I-4	1- 7-60	1-13-60	236	25.2	10.7	10.2	10.4	37.2	31.2	34.7	31.2	28.4	29.6	1-1/2
Current Machine Average				26.4			10.8			33.9			30.7	
Cumulative Machine Average				26.8			10.3			35.2			32.8	
Machine Factor, %				98.3			104.3			96.2			93.6	
Machine Index, %				97.1			106.1			92.4			92.9	

TABLE XII

SUMMARY OF TEST RESULTS FOR MACHINE J
January, 1960

J-1	12-15-59	12-29-59	4	29.1	10.8	9.3	10.0	41.4	33.0	36.5	31.6	30.0	30.9	1-1/2
J-2	12-18-59	1- 4-60	5	29.8	9.8	8.7	9.1	42.6	31.8	36.0	33.0	29.8	31.6	1-1/2
J-3	12-21-59	1- 4-60	6	30.0	9.8	9.0	9.4	36.6	34.8	35.5	34.8	31.8	33.0	1-1/2
J-4	1- 5-60	1-20-60	7	30.1	11.0	10.6	10.7	40.2	34.2	36.5	33.2	30.4	31.9	1-1/2
J-5	1- 8-60	1-20-60	8	28.8	10.2	9.7	10.0	39.6	34.2	36.6	35.8	34.6	35.4	1-1/2
J-6	1-14-60	1-25-60	9	29.2	10.3	9.7	10.0	37.0	35.4	37.1	33.4	31.0	32.4	1-1/2
J-7	1-15-60	1-25-60	10	29.3	10.6	9.4	10.1	41.4	30.0	34.3	34.0	29.6	32.1	1-1/2
Current Machine Average				29.5			9.9			36.1			32.5	
Cumulative Machine Average				29.4			9.6			34.6			30.9	
Machine Factor, %				100.3			103.2			104.4			105.1	
Machine Index, %				108.5			97.4			98.4			98.4	

TABLE XIII

SUMMARY OF TEST RESULTS FOR MACHINE K
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
K-1	12- 6-59	1- 15-60	51	26.9	9.1	8.2	8.6	38.4	32.4	35.6	33.4	26.8	29.7	1-1/2
K-2	12- 6-59	1- 15-60	52	26.8	9.8	9.3	9.6	40.8	34.2	37.1	30.6	27.8	29.9	1-1/2
K-3	12- 6-59	1- 15-60	53	27.8	9.8	8.8	9.2	42.0	36.0	38.5	32.6	30.0	31.2	1-1/2
K-4	12- 6-59	1- 15-60	54	27.7	9.7	9.0	9.3	36.0	33.0	34.9	33.4	30.6	32.4	1-1/2
K-5	12-17-59	1- 18-60	54	26.9	9.8	9.0	9.4	40.2	31.2	34.3	29.6	25.8	27.9	1-1/2
K-6	12-17-59	1- 18-60	55	27.1	10.0	9.0	9.5	37.8	33.0	35.0	28.4	26.4	27.7	1-1/2
K-7	1- 9-60	1- 18-60	1	27.6	9.7	8.8	9.1	34.2	32.4	33.1	30.4	28.4	29.6	1-1/2
K-8	1- 9-60	1- 18-60	2	26.3	9.1	8.8	9.0	33.0	31.2	32.3	28.2	26.0	26.9	1-1/2
Current Machine Average				27.2			9.2			35.1			29.4	
Cumulative Machine Average				27.4			9.3			35.7			29.2	
Machine Factor, %				99.1			99.6			98.3			100.9	
Machine Index, %				99.9			90.7			95.8			89.1	

TABLE XIV

SUMMARY OF TEST RESULTS FOR MACHINE L
January, 1960

L-1	12- 8-59	12-31-59	123	26.7	11.4	10.1	10.9	33.6	30.0	32.4	28.4	27.4	28.1	1-1/2
L-2	12-11-59	12-31-59	7	27.8	10.7	9.8	10.1	42.6	35.4	38.2	33.6	32.2	32.8	1-1/2
L-3	12-28-59	1-15-60	34	26.4	10.5	9.7	10.1	39.0	35.4	37.1	33.6	32.4	33.2	1-1/2
Current Machine Average				26.9			10.4			35.9			31.4	
Cumulative Machine Average				27.1			9.7			37.6			34.6	
Machine Factor, %				99.5			107.0			95.5			90.7	
Machine Index, %				99.2			102.2			97.9			95.0	

TABLE XV

SUMMARY OF TEST RESULTS FOR MACHINE M
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
M-1	12-16-59	12-31-59	225	27.4	10.7	10.0	10.2	38.4	36.0	37.0	33.8	30.8	32.3	1-1/2
M-2	12-16-59	12-31-59	226	29.0	10.7	10.0	10.2	39.6	36.6	38.0	35.4	34.0	34.8	1-1/2
M-3	12-30-59	1- 7-60	233	27.3	11.1	10.8	11.0	39.0	36.6	37.8	33.0	31.0	32.2	1-1/2
M-4	12-30-59	1- 7-60	234	27.4	11.3	10.6	10.9	36.0	34.8	35.4	32.6	30.4	31.6	1-1/2
M-5	1-12-60	1-19-60	241	28.0	10.8	10.1	10.5	36.6	34.8	35.9	33.4	30.8	32.2	1-1/2
M-6	1-12-60	1-19-60	242	27.9	10.8	10.2	10.6	37.2	34.8	35.9	33.8	31.2	31.9	1-1/2
Current Machine Average				27.8			10.6			36.6			32.5	
Cumulative Machine Average				27.2			10.5			32.6			29.6	
Machine Factor, %				102.2			100.9			112.3			110.0	
Machine Index, %				102.4			103.8			99.9			98.5	

TABLE XVI

SUMMARY OF TEST RESULTS FOR MACHINE N
January, 1960

N-1	12-30-59	1-15-60	--	26.3	10.3	10.0	10.2	34.2	31.8	33.0	31.6	30.2	30.8	1
N-2	1- 7-60	1-15-60	--	27.1	10.9	10.4	10.6	37.8	34.2	36.6	32.8	30.8	32.0	1
N-3	1- 8-60	1-15-60	--	27.0	11.2	10.4	10.8	38.4	36.0	37.3	32.4	32.0	32.3	1-1/2
N-4	1-12-60	1-19-60	--	26.7	10.6	9.8	10.3	38.4	35.4	36.7	32.0	30.0	31.1	1-1/2
N-5	1-15-60	1-19-60	--	26.9	11.1	10.4	10.8	34.8	33.6	34.0	31.0	29.2	30.2	1-1/2
Current Machine Average				26.8			10.5			35.5			31.3	
Cumulative Machine Average				26.4			9.9			35.7			32.8	
Machine Factor, %				101.5			106.0			99.6			95.3	
Machine Index, %				98.6			103.6			96.9			94.8	

TABLE XVII

SUMMARY OF TEST RESULTS FOR MACHINE O
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
O-1	12-23-59	12-28-59	229	27.6	11.7	11.0	11.4	37.8	34.8	36.7	32.8	31.2	32.0	1-1/2
O-2	12-23-59	12-28-59	230	27.7	11.8	11.2	11.4	39.0	33.0	36.5	33.8	32.6	33.1	1-1/2
O-3	1- 6-60	1-11-60	237	28.7	12.0	11.2	11.7	44.4	37.2	41.0	37.6	33.4	35.6	1-1/2
O-4	1- 6-60	1-11-60	238	28.4	11.9	11.4	11.6	41.4	39.0	40.1	37.8	35.8	36.8	1-1/2
O-5	1-20-60	1-25-60	245	29.0	12.0	11.2	11.7	40.2	31.8	36.0	34.8	32.6	34.0	1-1/2
O-6	1-20-60	1-25-60	246	28.7	11.8	11.2	11.5	37.2	32.4	34.3	35.8	31.2	33.3	1-1/2
Current Machine Average				28.4			11.5			37.4			34.1	
Cumulative Machine Average				27.5			11.1			35.4			32.6	
Machine Factor, %				103.3			104.4			105.9			104.8	
Machine Index, %				104.4			113.5			102.1			103.4	

TABLE XVIII

SUMMARY OF TEST RESULTS FOR MACHINE P
January, 1960

P-1	11-23-59	1- 6-60	1591	27.2	9.8	9.2	9.5	40.8	37.2	39.0	36.0	30.6	34.3	1-1/2
P-2	11-30-59	1- 6-60	2119	27.4	9.3	8.8	9.1	39.0	34.2	37.2	35.6	31.6	34.0	1-1/2
P-3	12- 2-59	1- 6-60	88	26.6	9.6	9.0	9.4	39.6	35.4	36.7	36.6	29.6	34.2	1-1/2
Current Machine Average				27.0			9.3			37.6			34.2	
Cumulative Machine Average				26.9			9.7			35.4			32.7	
Machine Factor, %				100.6			95.8			106.2			104.4	
Machine Index, %				99.6			91.7			102.7			103.5	

TABLE XIX

SUMMARY OF TEST RESULTS FOR MACHINE Q
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 100 sq. ft.	Caliper, points			Concora Flat Crush, p.s.i.			Single-Face Flat Crush, p.s.i.			Runability Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	
Q-1	1- 6-60	1-15-60	--	27.2	11.2	10.7	11.0	36.0	34.2	35.2	34.2	31.0	32.6	1
Q-2	1- 9-60	1-15-60	--	27.0	11.1	10.7	10.8	39.0	34.2	37.1	34.6	31.4	33.0	1-1/2
Q-3	1-13-60	1-19-60	--	27.4	10.9	10.2	10.4	41.4	34.8	36.8	35.4	31.6	32.8	1-1/2
Q-4	1-16-60	1-19-60	--	27.5	10.8	9.8	10.5	39.6	36.0	37.7	32.0	29.6	30.6	1-1/2
Current Machine Average				27.3			10.7			36.7			32.3	
Cumulative Machine Average				26.9			10.0			37.7			34.4	
Machine Factor, %				101.3			106.4			97.4			94.0	
Machine Index, %				100.4			105.0			100.1			97.8	

TABLE XX

SUMMARY OF TEST RESULTS FOR MACHINE R
January, 1960

R-1	12-29-59	1-22-60	5	29.0	11.6	10.4	10.9	33.0	32.4	32.5	31.8	29.2	30.8	1-1/2
R-2	12-30-59	1-22-60	6	29.3	11.2	9.9	10.8	38.4	30.0	34.3	31.2	28.0	29.8	1-1/2
Current Machine Average				29.2			10.8			33.4			30.3	
Cumulative Machine Average				29.0			9.8			31.5			30.3	
Machine Factor, %				100.7			111.0			106.1			100.0	
Machine Index, %				107.4			106.6			91.2			91.8	

TABLE XXI

SUMMARY OF TEST RESULTS FOR MACHINE S
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb./per 100 sq. ft.	Caliper, points Max.	Caliper, points Min.	Caliper, points Av.	Concora Flat Crush, p.s.i. Max.	Concora Flat Crush, p.s.i. Min.	Concora Flat Crush, p.s.i. Av.	Single-Face Flat Crush, p.s.i. Max.	Single-Face Flat Crush, p.s.i. Min.	Single-Face Flat Crush, p.s.i. Av.	Runability Maximum Tension at 600 f.p.m., lb./in.
S-1	1-12-60	1-22-60	5	29.6	9.1	8.8	9.0	32.4	28.8	30.5	29.6	26.6	28.7	1-1/2
S-2	1-13-60	1-22-60	6	30.4	9.8	9.0	9.5	34.2	31.2	32.4	29.4	28.4	28.8	1-1/2
Current Machine Average				30.0			9.2			31.4			28.7	
Cumulative Machine Average				28.8			8.8			35.9			32.4	
Machine Factor, %				104.1			105.5			87.6			88.6	
Machine Index, %				110.4			90.8			85.8			87.0	

TABLE XXII

SUMMARY OF TEST RESULTS FOR MACHINE T
January, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb./per 100 sq. ft.	Caliper, points Max.	Caliper, points Min.	Caliper, points Av.	Concora Flat Crush, p.s.i. Max.	Concora Flat Crush, p.s.i. Min.	Concora Flat Crush, p.s.i. Av.	Single-Face Flat Crush, p.s.i. Max.	Single-Face Flat Crush, p.s.i. Min.	Single-Face Flat Crush, p.s.i. Av.	Runability Maximum Tension at 600 f.p.m., lb./in.
T-1	12-30-59	1-21-60	684	27.3	10.8	9.6	10.3	34.8	29.4	33.2	32.0	28.4	30.7	1/2
T-2	1- 4-60	1-21-60	83	26.2	10.1	9.6	9.8	37.2	34.2	35.5	32.4	29.8	31.2	1
T-3	1- 6-60	1-21-60	148	25.4	10.3	9.2	9.8	35.4	29.4	32.9	32.4	29.6	30.8	1
Current Machine Average				26.3			10.0			33.9			30.9	
Cumulative Machine Average				27.0			10.5			40.2			35.9	
Machine Factor, %				97.6			95.2			84.3			86.0	
Machine Index, %				96.8			98.2			92.4			93.7	

DISCUSSION OF CONCORA FLAT CRUSH TEST RESULTS OBTAINED AT THE INSTITUTE OF PAPER CHEMISTRY AND THOSE OBTAINED AT THE MILLS

In Table XXIII a comparison of Institute and mill Concora flat crush test results obtained on conditioned specimens is given for the month of January. These comparisons were initiated in Progress Report 30 and permit interested participants to submit their Concora flat crush test results to The Institute of Paper Chemistry so that comparative results may be included in the monthly reports. Data sheets for supplying this information may be obtained from the Institute. Comparisons of this kind are a helpful adjunct to other calibration procedures. It may be noted in Table XXIII that fourteen of the twenty participating machines are included in this comparison of Concora flat crush data. Shown in Table XXIII are the Institute and mill Concora averages for each roll included in this comparison. The average difference between the current machine average based on Institute data and that based on mill data is shown in Table XXIII for each machine. For each roll the difference between the average Concora result based on Institute data and that based on mill data is also shown. The plus or minus sign denotes whether the mill average was higher or lower than the Institute average.

TABLE XXIII

INSTITUTE AND MILL CONCORA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR JANUARY, 1960

Machine A

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
A-1	529	12-22-59	38.3	40.8	+2.5
A-2	530	12-29-59	38.4	44.2	+5.8
A-3	531	1- 1-60	41.4	42.8	+1.4
A-4	532	1- 8-60	41.8	41.2	-0.6
A-5	533	1- 8-60	39.8	40.0	+0.2
A-6	534	1-12-60	40.8	44.0	+3.2
A-7	535	1-15-60	39.8	44.4	+4.6
A-8	536	1- 20-60	37.6	39.2	+1.6
Current Machine Av.			39.7	42.1	+2.4

Machine B

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
B-1	--	12-28-59	33.4	36.5	+3.1
B-2	--	1- 4-60	35.9	37.8	+1.9
B-3	--	1- 7-60	31.7	37.3	+5.6
B-4	--	1-11-60	35.2	35.3	+0.1
B-5	--	1-14-60	35.3	35.8	+0.5
Current Machine Av.			34.3	36.5	+2.2

Machine E

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
E-1	332	11-20-59	40.4	41.1	+0.7
E-2	333	12-11-59	34.9	36.8	+1.9
E-3	334	12-14-59	34.4	35.5	+1.1
E-4	335	12-14-59	35.6	40.2	+4.6
E-5	336	12-16-59	37.0	39.6	+2.6
E-6	337	12-19-59	36.6	38.6	+2.0
E-7	338	12-23-59	36.6	37.8	+1.2
E-8	339	1- 1-60	37.6	37.1	-0.5
E-9	340	1- 7-60	38.5	40.7	+2.2
E-10	341	1- 9-60	36.8	37.4	+0.6
Current Machine Av.			36.9	38.5	+1.6

Machine F

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
F-1	228	12-14-59	34.6	36.7	+2.1
F-2	229	12-17-59	34.1	36.6	+2.5
F-3	230	12-20-59	33.4	34.7	+1.3
F-4	231	12-21-59	34.9	36.1	+1.2
F-5	232	1- 7-60	37.4	35.6	-1.8
F-6	233	1- 8-60	36.7	38.5	+1.8
F-7	234	1-11-60	31.4	30.7	-0.7
F-8	235	1-12-60	33.5	34.7	+1.2
Current Machine Av.			34.5	35.4	+0.9

Machine G

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
G-1	221	12-28-59	33.2	37.1	+3.9
G-2	222	12-28-59	30.7	34.2	+3.5
G-3	229	12-28-59	32.3	34.5	+2.2
G-4	230	12-28-59	32.3	36.1	+3.8
G-5	237	1- 6-60	35.5	36.4	+0.9
G-6	238	1- 6-60	34.4	35.2	+0.8
Current Machine Av.			33.1	35.6	+2.5

Machine H

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
H-1	372	12-22-59	38.0	37.6	-0.4
Current Machine Av.			38.0	37.6	-0.4

[a] The difference given here is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

TABLE XXIII-Continued

INSTITUTE AND MILL CONCORA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR JANUARY, 1960

Machine I

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
I-1	227	12-21-59	33.4	42.2	+8.8
I-2	228	12-21-59	34.9	36.8	+1.9
I-3	235	1- 7-60	32.5	34.0	+1.5
I-4	236	1- 7-60	34.7	32.6	-2.1
Current Machine Av.			33.9	36.4	+2.5

Machine K

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
K-1	51	12-6-59	35.6	38.3	+2.7
K-2	52	12- 6-59	37.1	40.1	+3.0
K-3	53	12-6-59	38.5	38.9	+0.4
K-4	54	12-6-59	34.9	41.5	+6.6
K-5	54	12-17-59	34.3	36.0	+1.7
K-6	55	12-17-59	35.0	36.0	+1.0
K-7	1	1- 9-60	33.1	33.6	+0.5
K-8	2	1- 9-60	32.3	32.9	+0.6
Current Machine Av.			35.1	37.2	+2.1

Machine M

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
M-1	225	12-16-59	37.0	37.8	+0.8
M-2	226	12-16-59	38.0	37.4	-0.6
M-3	233	12-30-59	37.8	39.5	+1.7
M-4	234	12-30-59	35.4	37.3	+1.9
M-5	241	1-12-60	35.9	37.4	+1.5
M-6	242	1-12-60	35.9	37.4	+1.5
Current Machine Av.			36.6	37.8	+1.2

Machine N

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
N-1	--	12-30-59	33.0	33.5	+0.5
N-2	--	1- 7-60	36.6	33.8	-2.8
N-3	--	1- 8-60	37.3	38.9	+1.6
N-4	--	1-12-60	36.7	34.9	-1.8
N-5	--	1-15-60	34.0	34.2	+0.2
Current Machine Av.			35.5	35.1	-0.4

Machine O

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
O-1	229	12-23-59	36.7	42.5	+5.8
O-2	230	12-23-59	36.5	38.4	+1.9
O-3	237	1- 6-60	41.0	45.7	+4.7
O-4	238	1- 6-60	40.1	46.7	+6.6
O-5	245	1-20-60	36.0	38.8	+2.8
O-6	246	1-20-60	34.3	40.2	+5.9
Current Machine Av.			37.4	42.0	+4.6

Machine P

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
P-1	1591	11-23-59	39.0	36.8	-2.2
P-2	2119	11-30-59	37.2	40.2	+3.0
P-3	88	12- 2-59	36.7	39.7	+3.0
Current Machine Av.			37.6	38.9	+1.3

Machine Q

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
Q-1	--	1- 6-60	35.2	36.2	+1.0
Q-2	--	1- 9-60	37.1	38.4	+1.3
Q-3	--	1-13-60	36.8	38.0	+1.2
Q-4	--	1-16-60	37.7	37.6	-0.1
Current Machine Av.			36.7	37.6	+0.9

Machine T

Code	Mill Roll No.	Date Made	Concora Flat Crush, p.s.i. Institute	Mill	Difference [a]
T-1	684	12-30-59	33.2	28.1	-5.1
T-2	83	1- 4-60	35.5	35.2	-0.3
T-3	148	1- 6-60	32.9	32.4	-0.5
Current Machine Av.			33.9	31.9	-2.0

[a] The difference given here is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

The data shown in Table XXIII are summarized in Part I of Table XXIV where for each machine the following information is given: (1) Current machine average based on Institute data, (2) current machine average based on mill data, (3) the average difference--that is, the difference between the current machine average based on Institute data and that based on mill data and (4) the maximum difference encountered in comparing Institute and mill test averages for individual rolls. In Part II of Table XXIV the average difference of Part I has been converted to per cent by dividing it by the Institute average and multiplying the result by 100. The average differences in per cent for the current report and the two preceding reports are shown. It may be seen that the highest average difference of 12.3% was associated with Machine O for the current period and the lowest of 1.1% with Machines H and N. Differences greater than five per cent were noted for Machines A, B, G, I, K, O, and T. Only the difference for Machine O was greater than ten per cent. In the majority of comparisons, agreement between Institute and mill data was good.

The comparison of Institute and mill Concora flat crush results is summarized below to show the number of machines (and the cumulative percentage of all machines which this number represents) whose average Concora flat crush test results for the month of January fall within designated percentage ranges from the corresponding data obtained at the Institute:

Average Percentage Difference Between Institute and Mill Concora Flat Crush Test Results [a]	Number of Machines	Percentage of All Machines
± 1.0	0	0.0
± 2.5	3	21.4
± 5.0	7	50.0
± 7.5	12	85.7
± 10.0	13	92.9
± 12.3	14	100.0

[a] The average obtained at the Institute was used as the point of reference in the calculation of the percentage differences.

TABLE XXIV

PART I: A COMPARATIVE SUMMARY FOR EACH MACHINE OF THE CONCORA FLAT CRUSH AVERAGES BASED ON INSTITUTE DATA AND THOSE BASED ON MILL DATA

Machine Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Number of Rolls Compared	8	5	9	0	10	8	6	1	4	0	8	0	6	5	6	3	4	0	0	3
Concora Flat Crush, p.s.i.																				
Current Machine Av.(Institute)[a]	39.7	34.3	--	--	36.9	34.5	33.1	38.0	33.9	--	35.1	--	36.6	35.5	37.4	37.6	36.7	--	--	33.9
Current Machine Av.(Mill)[a]	42.1	36.5	--	--	38.5	35.4	35.6	37.6	36.4	--	37.2	--	37.8	35.1	42.0	38.9	37.6	--	--	31.9
Average Difference [b]	+2.4	+2.2	--	--	+1.6	+0.9	+2.5	-0.4	+2.5	--	+2.1	--	+1.2	-0.4	+4.6	+1.3	+0.9	--	--	-2.0
Maximum Difference [c]	+5.8	+5.6	--	--	+4.6	+2.5	+3.9	-0.4	+8.8	--	+6.6	--	+1.9	-2.8	+6.6	+3.0	+1.3	--	--	-5.1

PART II: A TABULATION FOR EACH MACHINE OF THE AVERAGE DIFFERENCE (PER CENT) BETWEEN THE CONCORA FLAT CRUSH AVERAGE BASED ON INSTITUTE DATA AND THAT BASED ON MILL DATA

Average Difference, % [d]																				
Current Report (Jan.)	+6.0	+6.4	--	--	+4.3	+2.6	+7.6	-1.1	+7.4	--	+6.0	--	+3.3	-1.1	+12.3	+3.5	+2.5	--	-- [e]	-5.9
57th Report (Dec.)	+4.9	-1.5	--	--	--	-0.6	+6.2	-2.0	+6.8	+3.4[e]	+3.9	-1.3[e]	+8.6	-3.4	+10.6	+1.1	-1.1	+3.3[e]	+7.4[e]	-3.5
55th Report (Nov.)	+7.0	+1.5	--	--	+10.0	+1.4	+8.8	-2.3	+3.7	--	-2.0	--	+4.9	-6.7	+11.0	+2.6	-2.6	--	--	-3.8

[a] Comparisons based on current machine average include only those rolls for which mill data were submitted.

[b] Average difference is the difference between the current machine average based on I.P.C. test results and that based on mill test results with the I.P.C. test results used as the reference. See Table XXIII.

[c] Maximum difference is the greatest difference encountered in comparing I.P.C. and mill test averages for individual rolls. See Table XXIII.

[d] Average difference (per cent) is computed by dividing the average difference in p.s.i. (shown above in Part I of this table) by the I.P.C. current machine average and multiplying the result by 100.

[e] This comparison is based on Concora flat crush results for specimens tested immediately after being fluted.

THE INSTITUTE OF PAPER CHEMISTRY

W. N. Hubert, Research Aide
Container Section

R. C. McKee, Chief, Container Section